# Report on an Investigation of Sediment Contamination
# The Waukegan River-Waukegan, Illinois
# and Pettibone Creek
# at the
# Great Lakes Naval Training Center, Illinois
# Sampled May 22, 1980

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## Introduction

Samples taken by the U.S. Environmental Protection Agency (USEPA) at the Great Lakes Naval Training Center in 1975 (1) showed that the inner harbor sediment was heavily polluted with toxic metals. (The qualitative terms "Moderately polluted," "heavily polluted," "moderately contaminated," "highly contaminated," are based upon application of USEPA, Region V's Great Lakes Sediment Guidelines (2)). PCBs and pesticide residues were found in samples taken by the Illinois Environmental Protection Agency (IEPA) in 1970 and 1971 (3,4). The outer harbor sediment was contaminated with high levels of mercury. Sediment samples were collected by a USEPA contractor from Pettibone Creek upstream of the inner harbor on May 22, 1980 to determine the degree of contamination of the Pettibone Creek sediments. (See Figure 1).

Also included in this sediment survey were three sample sites in the Waukegan River in Waukegan, Illinois. (See Figure 2). PCB's and heptachlor residues had been reported by the IEPA in 1970 and 1971 (3,4) in the Waukegan River. The purpose of the Waukegan River sediment survey was to check for the present day levels of inorganic and organic toxic contaminants.

## Conclusions

Data from surface grab sediment samples shows that Pettibone Creek sediments are heavily contaminated at two sample sites. The inorganic data shows sites 3 and 4 are heavily contaminated with metals, while sites 1, 2, 5, and 6 show low to moderate contamination. The organic data show sites 3 and 4 contaminated with heptachlor and DDT residues.

Sample sites 1, 2, 5, and 6 are not appreciably contamined with toxic organic compounds.

Data from surface grab sediment samples shows that Waukegan River sediments are moderately polluted. The inorganic data shows sediment contamination is moderate to heavy at site 3 and low to moderate at sites 1 and 2. The organic data shows sites 1 and 2 are not appreciably contaminated while site 3 is contaminated with toluene and di-2-ethylhexyl phthalate.

Recommendations

Pettibone Creek -

1. The presence of oil in the vicinity of site 5 noted on both March 27, 1980 and May 22, 1980 seems to indicate a persistent or recurring problem of spillage, leakage, or discharge of petroleum-like products to Pettibone Creek. The source of the contamination should be determined, measures should be taken to prevent further contamination of the creek, and appropriate cleanup of the creek should be undertaken.

2. The source of the elevated DDT residues at sites 3 and 4 should be determined. A possible source may be old stocks (perhaps without ingredients listed) of pesticides containing DDT that may be stored or used at the Great Lakes Naval Training Center.

Waukegan River -

An inspection and investigation should be made of the storage practices

at the chemical company near the mouth of the river. The elevated levels of toluene and di-2-ethylhexyl phthalate in the sediments of the river at site 3 indicate the possibility of leakage or discharge from that facility.

Field Observations

Two field surveys were done on Pettibone Creek and the Waukegan River. The first survey was done on March 27, 1980 by Anthony Kizlauskas and Timothy Rea of the USEPA for the purpose of selecting sample locations. The second survey was done May 22, 1980 by ERG, Inc., a contractor, for the purpose of sediment sample collection.

On March 27, 1980, the Great Lakes Naval Training Center was visited to reconnoiter sediment sampling sites on Pettibone Creek. Pettibone Creek is a small shallow creek in a ravine, flowing through the Naval Center to its mouth in Lake Michigan. The creek flows through a suburban residential type area.

Six sediment sample sites were picked during this survey. Near site 5 the observers noted an oil sheen on the water surface. Reportedly some gasoline or oil was spilled into the creek from a nearby road. The survey team then proceeded to Waukegan, Illinois to reconnoiter sediment sampling sites for the Waukegan River. Three sample sites were selected. The Waukegan River is a small slow flowing river in an urban area surrounding the survey site. Upstream from site 1 the river emerges from a culvert. This area is in a grassy

ravine that was strewn with refuse and debris when this site was surveyed. Downstream from site 1 the river widens and deepens. The area near sample site 2 and site 3 is surrounded by industry, most notably a railroad yard, a scrap yard, and a chemical plant. At site 2 the water was discolored and had a septic odor. Just downstream of this site, the river had a pronounced oil sheen. Site 3 was selected 120' upstream of the mouth of the river. This site was selected to detect possible sediment contamination from the chemical plant on the north bank of the river. The survey team noted that although there were no outfalls observed from the chemical plant to the river, there were numerous overturned 55 gallon drums, some rusted out, some punctured and apparently empty laying against a chain link fence bordering the river. The survey team was not able to determine where the contents of the drums had been disposed of, but the possibility of river contamination seemed likely.

On May 22, 1980 the survey crew from ERG, Inc., collected sediment samples at six sites on Pettibone Creek and at three sites on the Waukegan River. The field notes of that survey are found in Table 4.

On Pettibone Creek, at sample site 5, a thick red oil film was found in a pool below the sample site. The sediments at site 5 had an oily odor and a surface oil film.

Sediments at site 4 were also oily and oil was released from them when the sediments were stirred up. Sediment type at both Pettibone

Creek and the Waukegan River ranged from rubble and gravel to silt and muck. At most locations several grab samples had to be taken for a composite because of rocks and debris clogging the dredge. Photos of the sample sites on Pettibone Creek and on the Waukegan River were taken.

Sampling Methods

The sample containers used were one quart glass jars. The jars were washed with soap and water and then thoroughly rinsed with deionized water. Before capping the jars used for bulk inorganic analysis, high density plastic was placed over the mouth of the jar and before capping the jars used for organic analysis, an aluminum foil liner was placed over the mouth of the jar.

The samples were collected using an Ekman dredge. The sediment collected for inorganic analysis was transferred into a polyethylene tub, and then using a plastic spoon, transferred into a jar. The sediment for organic analysis was placed in a glass tub and transferred to the jar using a metal spoon. The samples were placed in an ice chest and kept cool until transfer. All equipment was rinsed with site water before sample collection.

Access to the sites on Pettibone Creek was obtained by walking into the water on the downstream side and then lowering the dredge. A canoe was used to gain access to the sites on the Waukegan River.

The quality assurance program conformed to Quality Assurance Program Guidelines and Specifications, Criteria and Procedures, Region V USEPA. Sample analysis procedures were those used by Region V, USEPA Surveillance and Analysis Division, as found in "Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing" (NTIS #PB294-596/AS).

## Results

Table 1 compares inorganic data from a survey of the inner and outer harbors of the Great Lakes Naval Training Center done by USEPA in 1975, with data from the May 22, 1980 Pettibone Creek sediment survey. It is important to note that for all data on organic parameters, detection levels below 100ng/g (100ppb) are not considered reliable. Table 2 compares sediment organic contaminant data from Pettibone Creek from the May 22, 1980 survey with the IEPA surveys of 1970 and 1971. Table 3 summarizes the data from the Waukegan River sediment studies in 1970-71 (3,4) and May 22, 1980. Table 4 summarizes field observations at the sample collection sites for the May 22, 1980 sediment survey.

## Discussion

A. Pettibone Creek

At sites 3 and 4, Pettibone Creek sediments are heavily contaminated with oil and grease and heavy metals. The data from this site correlates approximately with levels of contamination found in the inner and outer harbors at the Great Lakes Naval Training Center. It is interesting to note the Pettibone Creek sediment samples were not significantly contaminated with mercury, which was a problem in the inner and outer harbors. The other

sample sites at Pettibone Creek, sites 1, 2, 4, and 5 showed low to moderate levels of contamination. Site 3 showed high levels of DDT residues (1.8ppm). Site 4 also showed elevated levels of DDT residues. Earlier data from Pettibone Creek samples showed much lower levels of DDT contamination. The cause of this large rise in residual levels of DDT at site 3 and site 4 merits further investigation. The data showing DDT residues were rechecked to ensure that no PCB peaks had been overlooked. The review of the data confirmed that the levels of DDT found at sites 3 and 4 were real and that no PCB was detected for the May 22, 1980 samples.

B. Waukegan River Data

The only area of significant sediment contamination in the Waukegan River was at sediment sample site 3. This site showed moderate to heavy pollution with oil and grease and some heavy metals. Two organic contaminants, toluene and di-2-ethylhexyl phthalate, were found at elevated levels. No significant PCB or pesticide contamination was found at any of the sample sites. Sites 1 and 2 were low to moderately contaminated.

References

(1). Great Lakes Training Center-Report on the Degree of Pollution of Bottom Sediments. 1975 Harbor Sediment Sampling Program. July 2, 1975, USEPA, Region V.

(2). Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments, USEPA, Region V, April, 1977.

(3). "Pesticides Found in Sediments from Lake Michigan and Tributary Streams and Ravines in Illinois (1970" in "Pesticides in the Illinois Waters of Lake Michigan," EPA 660/3-74-002, 1974.

(4). "Pesticides, PCB's and Phthalates Found in Lake Michigan Sediments and in Tributary Stream and Ravine Sediments in Illinois (1971)" in "Pesticides in the Illinois Waters of Lake Michigan," EPA 660/3-74-002, 1974.

(5). Analysis of Samples taken by ERG, Inc., and analyzed by Central Regional Laboratory, Region V, USEPA, 1980.

(6). Analysis of samples taken by ERG, Inc. and analyzed by Environdyne Engineers, Inc., St. Louis, Missouri, 1980.

Table I

Summary of Inorganic Data for Sediment Samples Taken from the Great Lakes Naval Training Center, Illinois

All data reported as mg/kg dry weight

| | Date of Survey | | | |
|---|---|---|---|---|
| | July 2, 1975 (1) | | May 22, 1980 (5) | |
| | Location | | Location | |
| Parameter | Inner Harbor range (4 sites) | Outer Harbor range (3 sites) | Pettibone Creek site #4 | Pettibone Creek site #3 |
| Oil and Grease | 3,800-5,600 | 600-1,500 | 6,100 | 2,070 |
| Arsenic | 11-16 | 25-40 | 18 | 10 |
| Cadmium | 3.1-4.7 | 1.8-3.3 | 3 | 2 |
| Chromium | 35-52 | 31-57 | 47 | 34 |
| Copper | 183-276 | 42-116 | 560 | 170 |
| Mercury | 0.7-3 | 0.6-14 | 0.452 | 0.10 |
| Lead | 296-375 | 165-240 | 380 | 110 |
| Zinc | 440-604 | 115-230 | 1,400 | 580 |

Table 2

Summary of Organic Data for Sediment Samples
Taken From the
Great Lakes Naval Training Center, Illinois

All data report as ng/g dry weight (ppb)

Location: Pettibone Creek

| | Date | | | |
|---|---|---|---|---|
| | 1970-71 (3 and 4) | May 22, 1980 (6) | | |
| | 10-50 yards, upstream from Lake Michigan | site #3 | site #4 | site #1 |
| Parameter | | | | |
| Heptachlor | .01 | 82 | 72 | ND |
| di-2-ethylhexyl phthalate | 51.3 | 10 | 42 | 4 |
| Aroclors | | | | |
| 1242 | 173.4 | ND | ND | ND |
| 1254 | 232 | ND | ND | ND |
| benzene-hexachloride | | ND | 49 | ND |
| p,p' DDE | 7.6 | 410 | 320 | ND |
| p,p' DDD | 41 | 420 | ND | ND |
| p.p' DDT | 54.3 | 1000 | ND | ND |
| Total DDT residues | 135 | 1830 | 320 | ND |

*ND = Not Detected

Table 3

Summary of Organic and Inorganic Data for Sediment Samples
Taken in the
Waukegan River, Illinois

Organic Data (ng/g dry weight)

| Location | Date | Parameter | |
|---|---|---|---|
| | | toluene | di-2-ethylhexylphthalate |
| Site #3 | May 22, 1980(6) | 3900 | 4200 |
| 10-50 yards upstream of Lake Michigan | 1970-1971 (3 and 4) | ND* | ND |

No pesticides or PCB's detected in significant quantities.

*ND = not detected

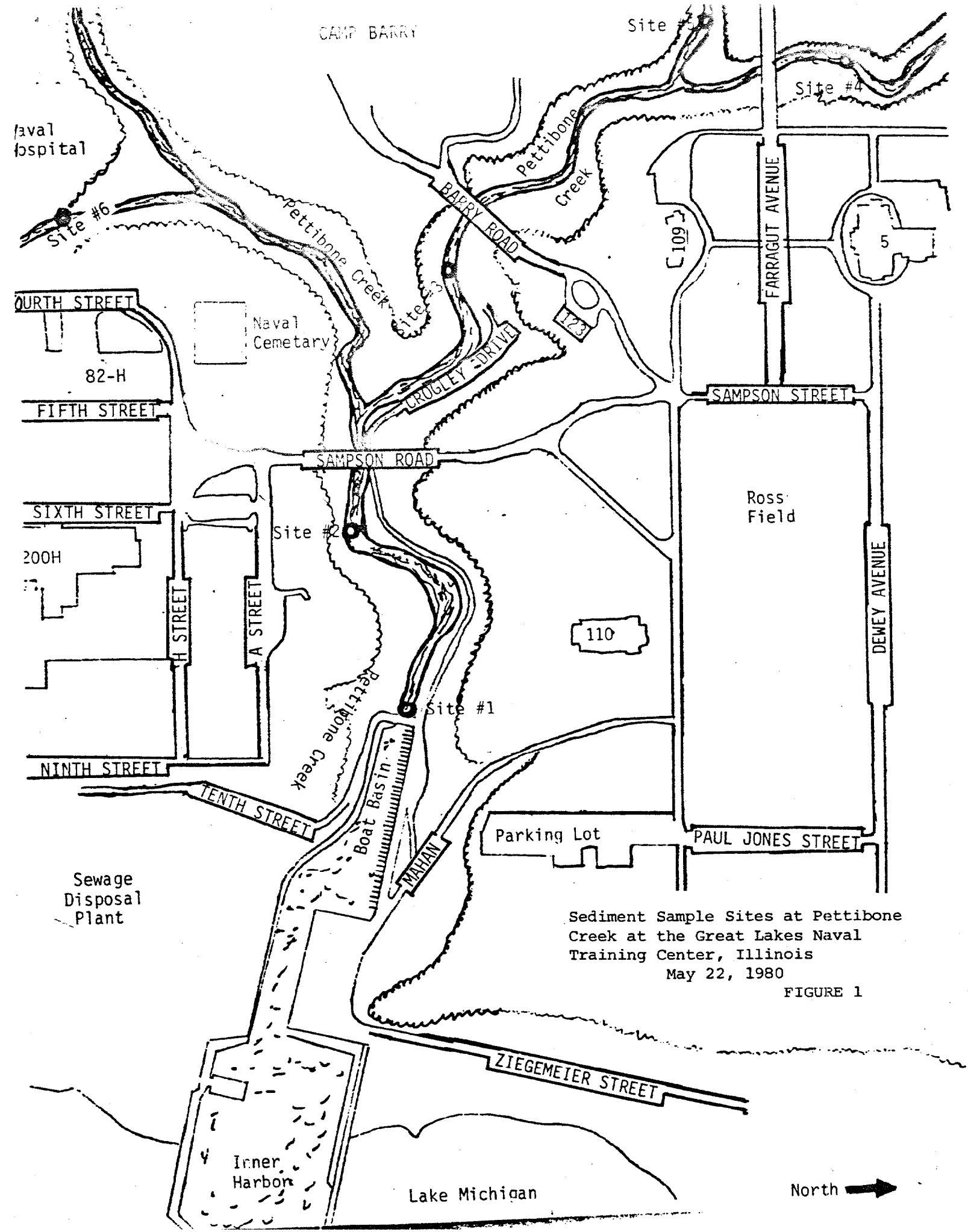
Inorganic Data (mg/kg dry weight)

| Location | Date | Parameter | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Oil and Grease | As | Cd | Cr | Cu | Hg | Pb | Zn |
| site #1 | May 22, 1980 | 152 | 2.7 | 1 | 32 | 44 | .03 | 220 | 350 |
| site #2 | May 22, 1980 | 838 | 3.3 | 2 | 28 | 21 | .03 | 280 | 210 |
| site #3 | May 22, 1980(5) | 5800 | 4.9 | 2 | 54 | 87 | .10 | 320 | 300 |

Table 4

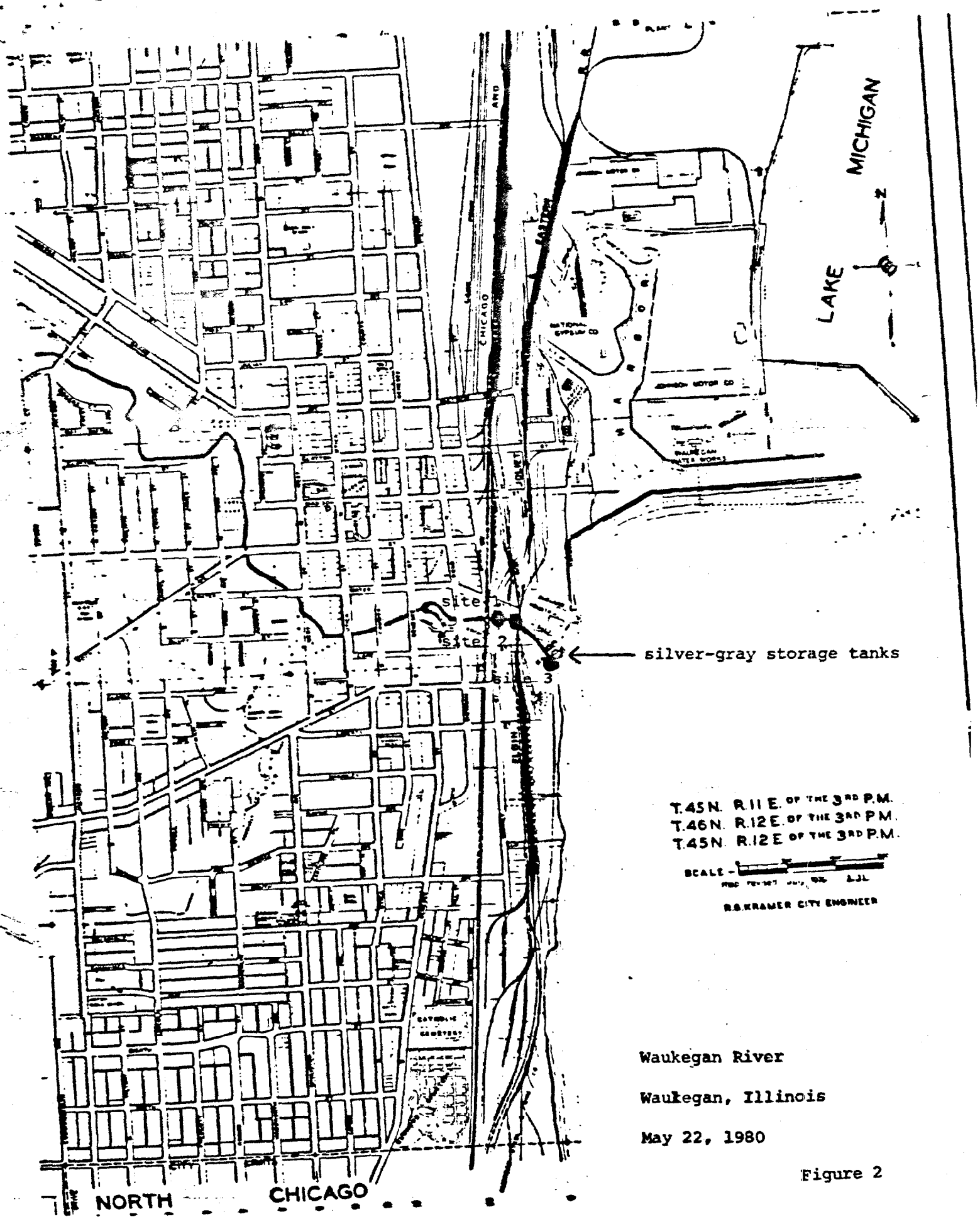
LOCATION: PETTIBONE CREEK
SAMPLED: MAY 22, 1980

| Site # | DEPTH(FT) | COLOR | SAMPLE DESCRIPTION | ODOR | OIL | REMARKS |
|---|---|---|---|---|---|---|
| 1 | 1.5 | Brown & Black | Rubble, sand, gravel | Fishy | None | Hard bottom - moved upstream to Collect sample, tried several locations. No detritus or organisms apparent. Replicate taken. |
| 2 | 2.0 | Gray over Black | Gravel & sand | Faintly Fishy | None | No detritus or organisms apparent |
| 3 | 2.0 | Black | Silt over sand | Earthy | None | No organisms apparent. Partially decayed detritus. |
| 4 | 2.6 | Black | Silt & muck | Septic | Light | Few sludgeworms. Partially and fully decayed detritus. Oil films more apparent when water stirred up. |
| 5 | .5 | Brown | Sandy silt | Oily | Light | Thick oil film just downstream. Light film seen on sediment. No organisms or detritus apparent. |
| 6 | .5 | Brown | Silt over sand | None | None | Few Sludgeworms. No detritus apparent. |
| LOCATION: WAUKEGAN RIVER<br>SAMPLED: MAY 22, 1980 | | | | | | |
| 1 | 2.0 | Black & Brown | Gravel & rubble | Septic | None | Many large rocks made it difficult. Decomposed detritus. No organisms apparent. |
| 2 | 2.0 | Brown | Sand & gravel | Fishy | None | Replicate taken. No organisms or detritus apparent. |
| 3 | 3.0 | Black | Silt & muck | Septic | None | No organisms apparent. Detritus not decomposed. |




Sediment Sample Sites at Pettibone Creek at the Great Lakes Naval Training Center, Illinois
May 22, 1980

FIGURE 1




Waukegan River

Waukegan, Illinois

May 22, 1980

Figure 2